FINAL DRAFT

WATER QUALITY IMPROVEMENT STRATEGIES FOR THE EVERGLADES

ALTERNATIVE COMBINATIONS FOR THE NORTH SPRINGS IMPROVEMENT DISTRICT BASIN

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INTRODUCTION

The North Springs Improvement District (NSID) Basin has an area of 7,422 acres and is located in western Broward County. A map of the NSID Basin is presented in *Figure 1*. The NSID Basin is a hydrologic tributary basin to the Everglades Protection Area (EPA) by virtue of the capability to pump excess runoff from the basin to Water Conservation Area 2A (WCA 2A). The NSID operates two pump stations to remove excess runoff from the basin for flood control purposes. Excess runoff from the basin can be pumped to either the L-36N canal, the L-36S canal, or WCA 2A by way of Pump Station No. 1, or to the L-36N canal by way of Pump Station No. 2.

Historic flow and water quality data from the following structures and stations were compiled to generate the Baseline data set shown in *Figure 2*.

NSID pump 1 - NSPRNG_C2A (DBKEY 15121) – historic flow data
NSPRNG_IN – historic water quality data
NSPRNG_HC (DBKEY 15119) – historic flow (for regression analysis)
NSPRNG_C14 (DBKEY 15120) – historic flow (for regression analysis)

As part of the District's Regulatory Action Strategy, in 2001, an upstream data collection program was implemented in the NSID Basin. These sampling sites are located within the basin and characterize water quality conditions at various locations upstream of NSID Pump Station No. 1. See Appendix A for details on these locations and the types of data collected. Note: The data from these sampling sites were not included in the Baseline data set shown in *Figure 2*.

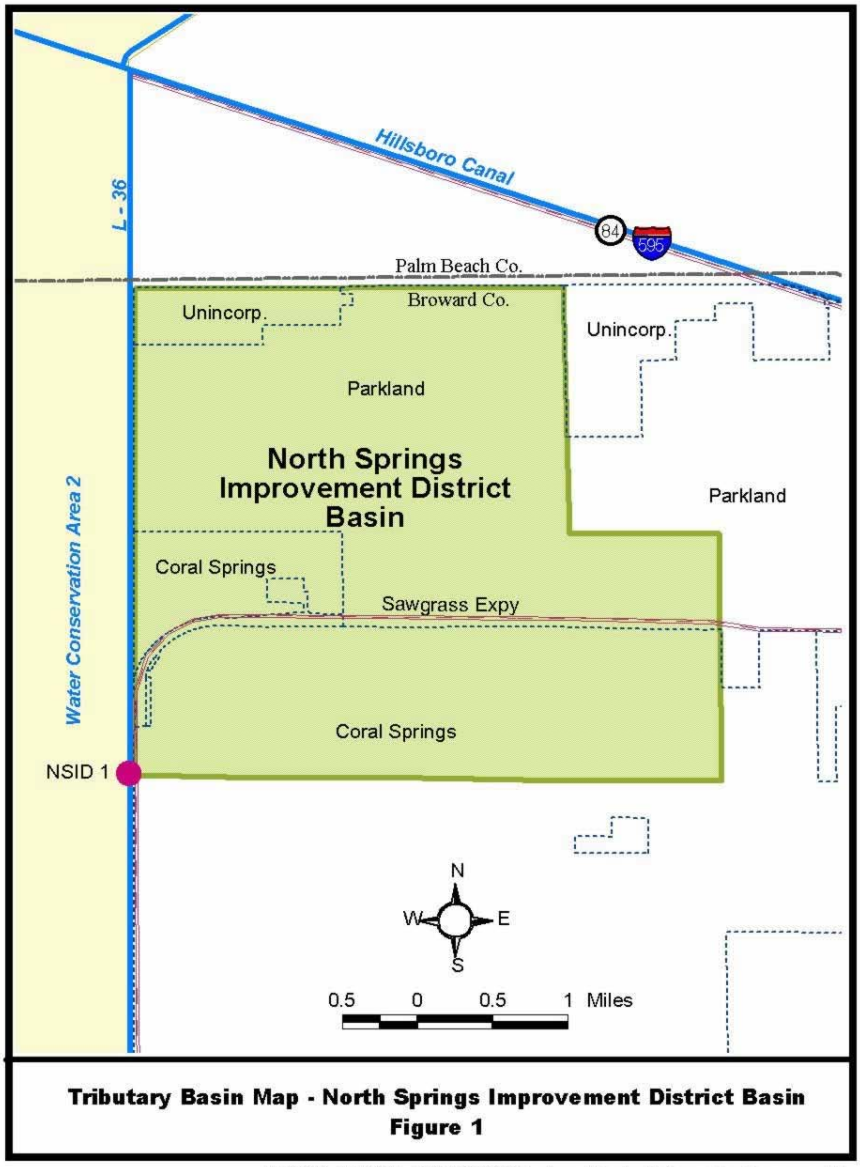
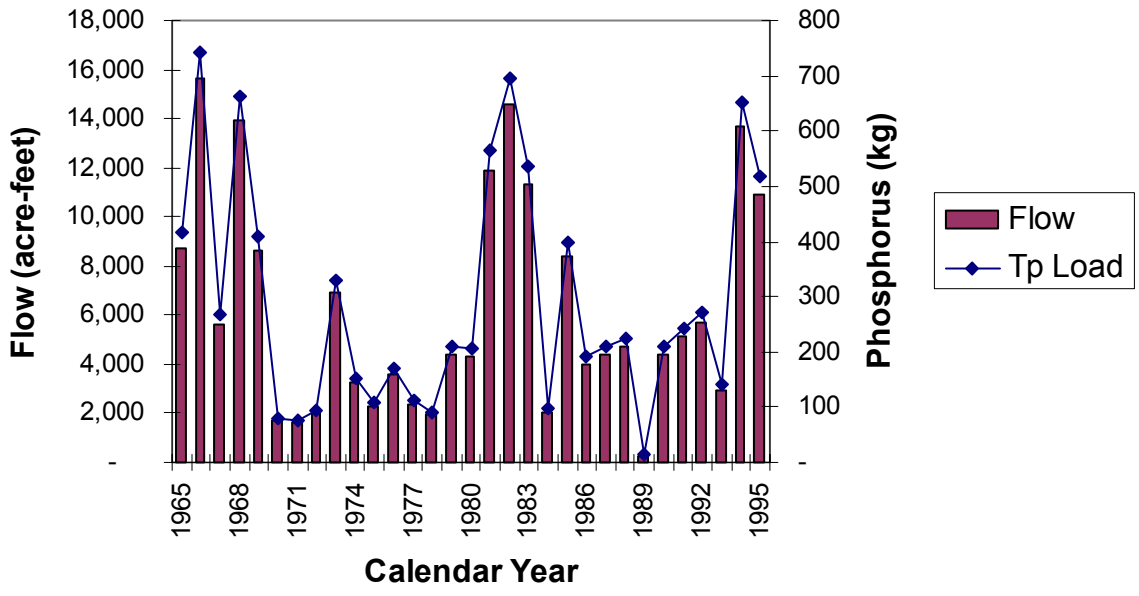


Figure 1. North Springs Improvement District Basin Location Map

Figure 2. Simulated Baseline Flows and Phosphorus Loads - NSID Basin



*Note: Baseline Flows and Phosphorus Loads shown in *Figure 2* are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. The flow-weighted average annual phosphorus concentration of 39 ppb was selected for use in the combined Baseline data set. Reference: *Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001*.

ALTERNATIVES FOR NSID BASIN

Alternative combinations of source controls, operational changes, local diversion options, and CERP projects for the NSID Basin are presented below. Because the NSID Basin preferentially discharges to the L-36N canal, and only pumps to WCA 2A during times of flooding, significant reductions in discharges to WCA 2A may be possible. Major components of the alternatives, along with probable influences on the flows and water quality of the discharges to WCA 2A, are briefly described. It is assumed that all alternatives will maintain existing levels of flood protection within the NSID Basin.

Alternative 1

- Source Control Component with Urban BMPs and Regulatory Program (2006)
- Diversion Component (2006)
- CERP Component: Hillsboro Impoundment (2007)

Alternative 2

- Source Control Component with Urban BMPs and Regulatory Program (2006)
- Diversion Component (2006)

Alternative 3

- Source Control Component with Urban BMPs and Regulatory Program (2006)
- CERP Component: Hillsboro Impoundment (2007)

Note: Separable costs will be provided for previously purchased land(s) which are to be incorporated in alternatives.

Alternative 1 - Implement a Source Control Component and a Diversion Component by 2006 until the CERP Component is Implemented in 2007.

Description:

A. **Source Control:** It is assumed that urban stormwater best management practices (BMPs), as defined by the Everglades Stormwater Program, will be implemented in the NSID Basin.
B. **Diversion:** This component involves the temporary diversion of water to the Bishop property rock pits on the north side of NSID by 12/31/2006 (using temporary pumps/structures). This diversion would serve as a solution for 1 year until the CERP component is complete in 2007.
C. **CERP:** All flows from NSID will be diverted to the CERP component (routed through L-36N and diverted to the to the Hillsboro Impoundment - Site 1) starting in 2007.

Influence on Flow:

A. **Source Control:** It is assumed that source controls will not provide any significant reduction in the Baseline flows.
B. **Diversion:** The temporary diversion component of this alternative would provide up to a 100% reduction in discharges to the EPA during the interim period by eliminating all discharges from this basin to the EPA**.** The Baseline flows, i.e., those basin flows that previously went to the EPA, should be used to size the diversion structures/components.
C. **CERP:** This component will continue to provide 100% diversion of all NSID flows away from the EPA to the CERP component starting in 2007.

Influence on Water Quality:

A. **Source Control:**. Source controls will be implemented by 2006 to reduce phosphorus in the basin, however, a sensitivity analysis is not required for this alternative since the phosphorus loading would be zero.
B. **Diversion:** The temporary diversion component of this alternative would provide up to a 100% reduction in phosphorus loads from this basin to the EPA during the interim period by eliminating all discharges from this basin to the EPA**.**
C. **CERP:** Once the CERP component is complete in 2007, the phosphorus load from this basin will continue to be 100% diverted away from the EPA.

Costs:

A. **Source Control:** There will be no cost estimates developed for source controls.
B. **Diversion:** Cost estimates for this component will include temporary diversion structures, O&M costs, etc., and may include land acquisition costs.
C. **CERP:** There will be no additional costs associated with this component.

Alternative 2 - Implement a Source Control Component with a Diversion Component by 2006.

Description:

A. Source Control: It is assumed that urban stormwater best management practices (BMPs), as defined by the Everglades Stormwater Program (ESP) will be implemented in the NSID Basin.

B. Diversion: For this alternative, it is assumed that there will be diversion of flows away from the EPA. This diversion would occur by providing additional surface storage in lakes or an impoundment within or adjacent to the basin, such as the Bishop property rock pit to the north of NSID, and thus eliminating the need to discharge excess runoff to the EPA. A list of potential diversion components is included in *Appendix A*. This diversion project would serve as a permanent solution and would reduce the volume of water to be discharged to the future CERP project (Hillsboro Impoundment - Site 1) thereby increasing the available storage capacity in the impoundment.

Influence on Flow:

A. Source Control: It is assumed that source controls will not provide any significant reduction in the Baseline flows.

B. Diversion: As part of an overall diversion program, there is a potential for up to a 100% reduction in flows from this basin to the EPA. The Baseline flows, i.e., those basin flows that previously went to the EPA, should be used to size the diversion structures/components.

Influence on Water Quality:

A. Source Control:. Source controls will be implemented by 2006 to reduce phosphorus in the basin, however, a sensitivity analysis is not required for this alternative since the phosphorus loading would be zero.

B. Diversion: The proposed diversion component of this alternative would provide up to a 100% reduction in phosphorus discharges to the EPA by eliminating all discharges from this basin to the EPA.

Costs:

A. Source Control: There will be no cost estimates developed for source controls.

B. Diversion: Cost estimates for this component will include diversion structures, land acquisition, canals, levees, canal improvements, O&M costs, etc.

Alternative 3 - Implement a Source Control Component by 2006 until Implementation of the CERP Project Component (Hillsboro Basin Impoundment - Site 1) in 2007.

Description:

A. **Source Control:** It is assumed that urban stormwater BMPs, as defined by the Everglades Stormwater Program, will be implemented in the NSID Basin.
B. **CERP (Impoundment and ASR):** The CERP component will include a 100% diversion of this basin's discharges away from the EPA to be implemented by 2007. All runoff from this basin would be diverted to the Hillsboro Impoundment to the north.

Influence on Flow:

A. **Source Control:** It is assumed that source controls will not provide any significant reduction in the Baseline flows.
B. **CERP:** With the CERP component in place, this basin's discharges will be diverted to the Hillsboro Impoundment and therefore will not enter the EPA. The CERP component will therefore eliminate all loads discharged from this basin to the EPA after 2007.

Influence on Water Quality:

A. **Source Control:** Prior to the CERP project coming on line, this basin's discharges to the EPA would continue. For the full evaluation of this alternative, the Baseline loads from the NSID basin to the EPA should be used. As part of a sensitivity analysis, the phosphorus load associated with discharges to the EPA from the NSID Basin (from the Baseline data set) will be reduced by 25%. The influence that this reduction has on the outflow phosphorus concentration and loads to the EPA will be calculated and summarized. After the CERP project comes on line, all discharges and loads from this basin will be zero.
B. **CERP:** As part of the CERP Project component, all of NSID's discharges to the EPA would be eliminated.

Costs:

A. **Source Control:** There will be no cost estimates developed for source controls.
B. **CERP:** There will be no additional costs associated with this component.

ADDITIONAL BACKGROUND INFORMATION

Source Control Component

Basin-wide Source Controls. Source controls will require the implementation of a comprehensive and basin-wide pollution prevention plan. The plan must include regulation promulgation, hiring and equipping maintenance personnel, infrastructure improvements, and hiring compliance and enforcement staff. These basin-wide source controls will consist of Urban BMPs and Regulatory Programs.

Urban Best Management Practices are stormwater management practices for urban areas. Examples include landscaping and vegetative practices, illicit discharge controls, litter and debris control, detention ponds and preventative maintenance programs.

Regulatory Programs (Permits and Permit Modifications) are developed to improve water quality, including identifying structures or systems requiring permits or modifications to permits. Regulatory programs may include any combination of voluntary BMPs, requirement and/or modification of permits, construction projects and basin-specific regulatory programs to achieve compliance with state water quality standards.

Diversion Component

The diversion component could consist of one or more of the following items. For this alternative, it is assumed that up to 100% of the basin's discharges would be diverted away from the Everglades Protection Area.

Primary Option:

- Offsite pumping into a quarry pit to the north with some capital improvements.

Secondary Options:

- L-36N may provide additional capacity to the Hillsboro with some capital improvements.
- L36S may provide additional capacity with some capital improvements.
- Modeling of the basin should be performed to determine the amount of reductions possible by each diversion scenario.
- Some interconnections to the East of NSID may provide some additional drainage. (See "Broward County Integrated Water Resource Plan - Northern Broward County Integrated Needs Assessment - March 2001, Page 13-7.) Specifically, NSID east to Pine Tree Water Control District.
- The agricultural fields and Northern Sub-Basin may be drained to the north directly into the Hillsboro Canal.
- These fields could be leased, used for flood control by providing water storage, until CERP project is ready.

- General operational efficiencies could be improved through better coordination to minimize the events where Pump Station #1 goes to the EPA.
- Additional lands within the NSID could be reserved until such time as the Hillsboro Impoundment is available, and be used to provide for additional water storage.
- By installing a pump station at the Eastern Sub-Basin boundary with the Western Sub-Basin, water may be diverted to the east during storm events.

Figure A-1. Map of NSID Sample Sites and Sub-Basins

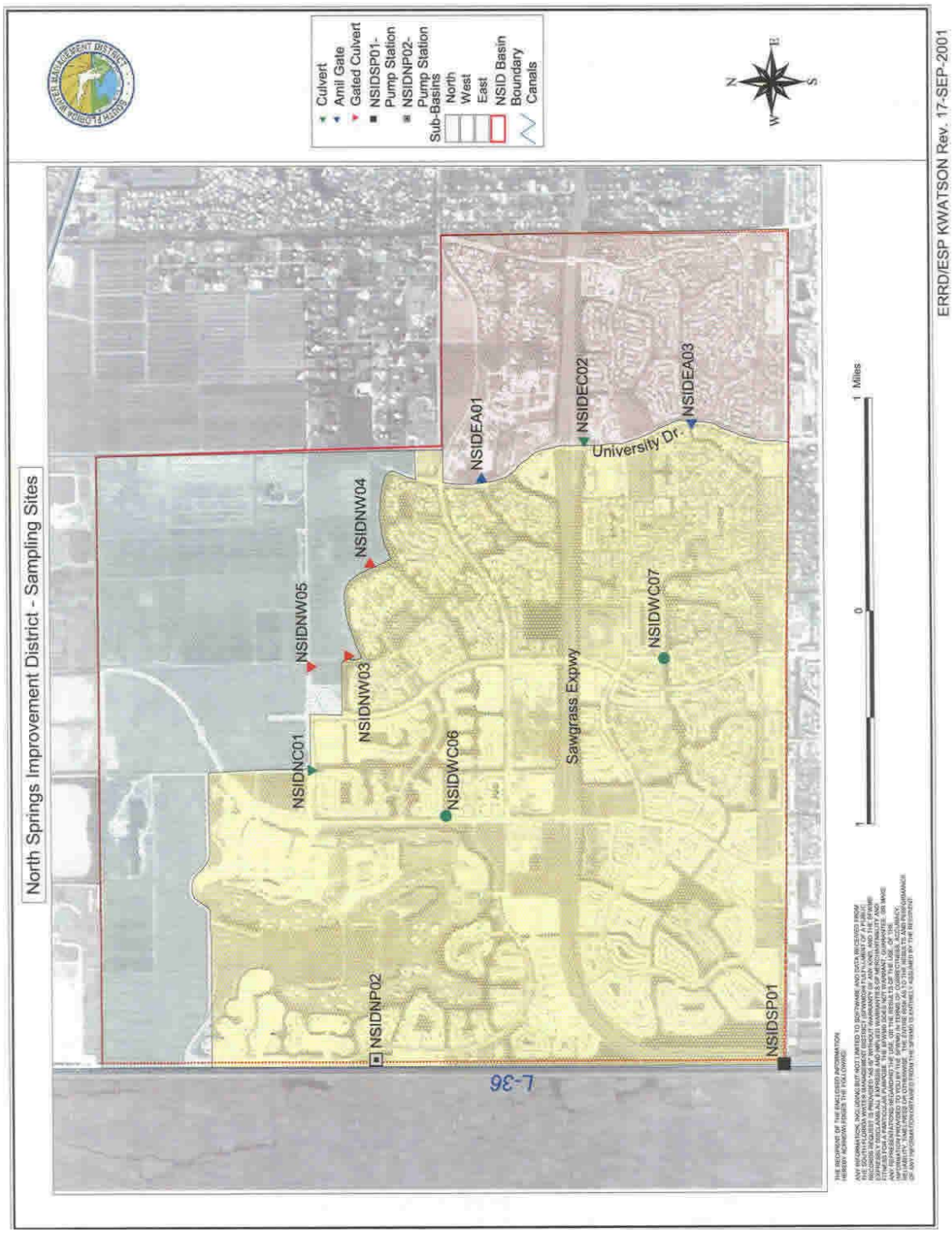


Table A-2. NSID Basin Data Collection Program - Analytical Parameters

Site	Proposed Program		Sampling Method
	Parameter	Frequency	
Primary Discharge Structures:			
NSID Pump Station 1 (NSIDSP01)	TP	Weekly if flow occurs	Flow proportional autosampler.
NSID Pump Stations 1 and 2 (NSIDSP01 & NSIDNP02 respectively)	TP OPO4 NH4 TKN NOx TSS Turbidity Alkalinity Cl- MBAS	Storm event monitoring on a Biweekly (every other week) basis, if flow occurs.	Grab sampling
	pH Cond. DO Temp.	Storm event monitoring on biweekly (every other week) basis, if flow occurs.	In-situ
	Total Cu Mg Ca Hardness	Storm event monitoring on biweekly (every other week) basis, if flow occurs.	Grab sampling
Basin Divide Structures:			
NSID Structures: **East Basin**: NSIDEA01 NSIDEC02 NSIDEA03 **North Basin**: NSIDNC01 NSIDNW03 or NSIDNW04 (only one sample between them due to same farm source) NSIDNW05 **West Basin:** (north and south of the Sawgrass Expwy.) NSIDWC06 NSIDWC07	TP OPO4 NH4 TKN NOx TSS Turbidity Alkalinity Cl- MBAS	Storm event monitoring on a Biweekly (every other week) basis, if flow occurs.	Grab sampling (Note direction of flow)
	pH Cond. DO Temp.	Storm event monitoring on biweekly (every other week) basis, if flow occurs.	In-situ
	Total Cu Mg Ca Hardness	Storm event monitoring on biweekly (every other week) basis, if flow occurs.	Grab sampling
Pesticide Sampling Program (Samples sites to be determined)	Organo-phosphorus & nitrogen scan	Quarterly, during flow.	Grab sampling